

I claim:

1. A marine propulsion system, comprising:

a support structure attachable to said marine propulsion system and to a
5 marine vessel, said marine propulsion system being rotatable about a generally
vertical steering axis and a generally horizontal tilting axis;

a steering arm attachable to said marine propulsion system, said steering arm
being rotatable about said steering axis;

a steering actuator having a first portion attached to said support structure
10 and a second portion attached in force transmitting relation with said steering arm,
said steering arm extending into said second portion, said second portion being
movable within said first portion, said first portion remaining stationary with
respect to said support structure during rotation of said marine propulsion system
about either said steering axis or said tilting axis said steering actuator being a
15 hydraulic actuator, said first portion of said steering actuator comprising a
hydraulic cylinder and said second portion of said steering actuator being a
movable piston which is movable within said first portion of said steering actuator
in response to changes in hydraulic pressure between a first cavity and a second
cavity of said hydraulic cylinder;

20 a hydraulic pump having a pressurized outlet and a return inlet; and

a valve, connected in fluid communication between said hydraulic pump and
said hydraulic cylinder, said valve being responsive to movement of a steering
device to control the flow of pressurized fluid from said hydraulic pump to said
hydraulic cylinder and to control the flow of return fluid from said hydraulic
25 cylinder to said hydraulic pump.

2. The marine propulsion system of claim 1, wherein:

said steering device is a steering wheel of a marine vessel.

3. The marine propulsion system of claim 1, wherein:

5 said first cavity of said hydraulic cylinder is disposed at a first side of said movable piston and said second cavity of said hydraulic cylinder is disposed at a second side of said movable piston, said movable piston being disposed between said first and second cavities.

4. The marine propulsion system of claim 1, wherein:

10 said valve comprises a first conduit connected in fluid communication with said first cavity and a second conduit connected in fluid communication with said second cavity.

5. A marine propulsion system, comprising:

15 a support structure attachable to said marine propulsion system and to a marine vessel, said marine propulsion system being rotatable about a generally vertical steering axis and a generally horizontal tilting axis;

 a steering arm attachable to said marine propulsion system, said steering arm being rotatable about said steering axis;

20 a steering actuator having a first portion attached to said support structure and a second portion attached in force transmitting relation with said steering arm, said steering arm extending into said second portion, said second portion being movable within said first portion, said first portion remaining stationary with respect to said support structure during rotation of said marine propulsion system
25 about either said steering axis or said tilting axis said steering actuator being a hydraulic actuator, said first portion of said steering actuator comprising a hydraulic cylinder and said second portion of said steering actuator being a

movable piston which is movable within said first portion of said steering actuator in response to changes in hydraulic pressure between a first cavity and a second cavity of said hydraulic cylinder;

a hydraulic pump having a pressurized outlet and a return inlet; and

5 a valve, connected in fluid communication between said hydraulic pump and said hydraulic cylinder, said valve being responsive to movement of a steering device to control the flow of pressurized fluid from said hydraulic pump to said hydraulic cylinder and to control the flow of return fluid from said hydraulic cylinder to said hydraulic pump, said valve comprising a first conduit connected in
10 fluid communication with said first cavity and a second conduit connected in fluid communication with said second cavity.

6. The marine propulsion system of claim 5, wherein:

said steering device is a steering wheel of a marine vessel.

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7. The marine propulsion system of claim 5, wherein:

said first cavity of said hydraulic cylinder is disposed at a first side of said movable piston and said second cavity of said hydraulic cylinder is disposed at a second side of said movable piston, said movable piston being disposed between
20 said first and second cavities.

8. A marine propulsion system, comprising:

a support structure attachable to said marine propulsion system and to a marine vessel, said marine propulsion system being rotatable about a generally
25 vertical steering axis and a generally horizontal tilting axis;

a steering arm attachable to said marine propulsion system, said steering arm being rotatable about said steering axis;

a steering actuator having a first portion attached to said support structure and a second portion attached in force transmitting relation with said steering arm, 5 said steering arm extending into said second portion, said second portion being movable within said first portion, said first portion remaining stationary with respect to said support structure during rotation of said marine propulsion system about either said steering axis or said tilting axis said steering actuator being a hydraulic actuator, said first portion of said steering actuator comprising a 10 hydraulic cylinder and said second portion of said steering actuator being a movable piston which is movable within said first portion of said steering actuator in response to changes in hydraulic pressure between a first cavity and a second cavity of said hydraulic cylinder, said first cavity of said hydraulic cylinder being disposed at a first side of said movable piston and said second cavity of said 15 hydraulic cylinder being disposed at a second side of said movable piston;

a hydraulic pump having a pressurized outlet and a return inlet; and

a valve, connected in fluid communication between said hydraulic pump and said hydraulic cylinder, said valve being responsive to movement of a steering device to control the flow of pressurized fluid from said hydraulic pump to said 20 hydraulic cylinder and to control the flow of return fluid from said hydraulic cylinder to said hydraulic pump, said valve comprising a first conduit connected in fluid communication with said first cavity and a second conduit connected in fluid communication with said second cavity.

25 9. The marine propulsion system of claim 8, wherein:

said steering device is a steering wheel of a marine vessel.

10. The marine propulsion system of claim 9, wherein:
said movable piston is disposed between said first and second cavities.